A SERIES OF CASES OF INTUSSUSCEPTION IN CHILDHOOD.[1]

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THIS series is made up of twenty cases,—twelve were males and eight were females. They were treated at St. Thomas's Hospital and at the East London Hospital for Children, between the years 1898 and 1904. The cases were consecutive, and include all that have passed through my hands. The results are good, I think, but they only represent the improvement that has taken place at all hospitals of late years, due to the now almost universal custom of speedy operative interference, which is largely due to the efforts of Mr. E. A. Barker.

Nature of the Intussusception.—Of the twenty cases, nineteen were enterocolic, that is, involved both the large and small guts; the remaining case was of the colic variety. Of the former class ten were single and nine were double intussusceptions. The single intussusceptions were of the ordinary ileocæcal type. It is, however, possible that in two the starting-point was an invagination of the outer wall of the cæcum, since, after the reduction of the tumor, this part of the cæcal wall remained invaginated, and was with difficulty made to resume its normal shape.

Of the double tumors there were four cases of the entericileocæcal (iliaca-ileocolica) and five cases of the ileocolicileocæcal (ileocolic-colic) varieties.

These facts can be tabulated as follows:

Number of cases	20
Small and large gut involved	19
Large gut involved	1

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[1] Read before the Clinical Society of London, December 9, 1904.

(1) Ileocæcal	10, or 50 per cent.
(2) Ileocolic-ileocæcal (ileocolic-colic)	5, or 25 per cent.
(3) Enteric-ileocæcal (iliaca-ileocolica)	4, or 20 per cent.
(4) Colic	1, or 5 per cent.
	20, or 100 per cent.

The diagnosis of the enteric-ileocæcal was made if an enteric intussusception remained after the large gut had been entirely reduced.

An ileocolic-ileocæcal (ileocolic-colic) intussusception was diagnosed, if after the reappearance of the cæcum and the appendix there was still small intestine prolapsed through the valve.

On account of the frequent occurrence of double intussusceptions, Mr. E. M. Corner, in a very interesting paper (ANNALS OF SURGERY, May, 1903), expressed his opinion that the accepted ideas as to the comparative frequency of the different forms of intussusception must undergo a modification.

Mr. Corner has prepared a table showing what he believes to be the relative frequency of the different varieties, and has proposed a nomenclature for the double intussusceptions.

My own series certainly bear out the contention that double tumors are more frequent than has hitherto been considered to be the case. It is, however, open to doubt that a useful purpose is served by a complicated classification.

If we take the case of those intussusceptions that originate near the ileocæcal valve, we find that they are all of the ileocæcal type, and that the main characteristics of the intussusceptions are identical as regards their appearance and the structures forming their walls; and it is only after the reduction of the main tumor that the presence of a second intussusception allows a differential diagnosis to be made.

The ileocæcal region of the intestinal tract is a complicated one, and, having attracted much attention, is more richly endowed with names than any other region of the same length.

With a little ingenuity a very extensive nomenclature can be made out for intussusceptions arising in the neighborhood, and this will be still further increased by the frequent occurrence of double tumors. In the latter case the names to be assigned to the different forms will vary with the views of the individual making the classification.

For instance, should an intussusception that starts as a prolapse of the small gut through the ileocæcal valve be termed ileocolic-colic or ileocolic-ileocæcal, or suppose an enteric intussusception becomes impacted in the valve, and then both valve and enteric intussusception become invaginated into the colon, is the resulting tumor to be called enteric-ileocæcal or enteric-ileocolic-ileocæcal or enteric-ileocolic-ileocæcal colic or enteric-ileocæcal colic? Such compound names are made up on the assumption that the last intussusception to be reduced is the first to be formed, but I do not know if there is any proof that this is the case.

Even in the case of single tumors there are difficulties, thus: What is the proper designation of an intussusception that starts in the caput coli and eventually involves the small gut? Is it cæco-colic or cæco-ileocæcal or colic-ileocæcal? (Corner.) Again, suppose the appendix is found to be invaginated after the rest of the intussusception has been reduced, how is such a tumor to be named? In fact, any attempt to name all possible forms of intussusception can only lead to confusion.

I would suggest that, instead of complicating the nomenclature, it would be better to simplify it, and call all intussusceptions involving large and small gut entero-colic, and indicate whether they are double and where they started.

Although the ileocæcal variety is rarer than the existing tables make out, my own series seems to show that it is still frequently to be met with as a single intussusception.

The observations on which this paper is founded were made with the suspicion that compound tumors were fairly common, and I was careful to observe the state of the bowel at the end of the reduction.

In this series there occurred no example of an enteric or simple ileocolic intussusception. The latter, when it was met with, was only found after the main intussusception had been reduced. An ileocolic intussusception must always be of small extent, since the amount of small gut prolapsed through the ileocæcal valve must be limited by the length of the mesentery of the small gut, and it therefore stands to reason that the length of small gut involved cannot be more than double the length of the mesentery; as a matter of fact, it seems to very rarely reach even this extent.

In this variety the increase in length is made at the expense of the entering tube; in this particular, and in that the most advanced portion is not constant, it differs from other intussusceptions, and is really more of the nature of a prolapse than a genuine intussusception.

Diagnosis.—This, as a rule, is sufficiently easy, since the occurrence of the usual history and symptoms with the presence of a tumor in the abdomen or rectum renders the diagnosis practically certain. It is indeed on the presence of the tumor that we must rely to differentiate this disease from some forms of enteritis. My own experience has led me to the belief that a tumor can in by far the greater number of cases be felt without difficulty, and should there be any doubt, an anæsthetic will at once settle the question. The importance of giving an anæsthetic when in doubt, instead of waiting, has been insisted upon by Mr. F. C. Wallis (*Lancet*, June 11, 1904), and I should like to add my testimony to his. On the other hand, I have known a tumor confuse the diagnosis in two cases under my care. In one the tumor turned out to be a mass of glands near the cæcum, and in the other the tumor was a long dependent lobe of the liver.

Causation.—Of the sixteen cases in which a definite statement is made, there was only a history of improper feeding in three instances. In every instance the patients were well-nourished, healthy children; they were not rhachitic, nor did their appearance suggest improper feeding. Indeed, it seems probable that the success of the operative treatment may largely depend on the fact that the general good health of the patients enables them to combat successfully the shock of abdominal section.

This series, therefore, throws no light, except in a negative character, on the causation of intussusception.

Duration before Operation.—The extremes were seven hours and four days.

With the exception of two cases in which resection was performed, and in which there was a possibility respectively of a fourteen and twenty-one days' history, was there any relation between the duration of the symptoms and the difficulty of reduction; neither could I trace any relation between the nature of the intussusception and the facility or otherwise of the reduction.

Treatment.—This may now be stated to be primary abdominal section. Inflation, except as an auxiliary measure to reduce the tumor out of the pelvis, as advised by Mr. Kellock, is now abandoned. If further proof of the inefficiency of inflation were needed, Case 6 would furnish it. In this case, inflation was tried three times, and on each occasion the tumor reappeared.

The site of the incision is open to discussion.

If the intussusception has reached the pelvis, no one incision will be the most convenient at all stages of its reduction. The site of the abdominal opening must therefore be largely determined by the fact that it is necessary to perform the last stages of reduction with the tumor in sight. The incision adopted in this series was one through the right rectus muscle, its length was about three inches, and its centre lay three-fourths of an inch to the right and below the umbilicus.

This situation lies nearly at the centre of the circle traced by an intussusception, but is sufficiently near the normal site of the cæcum to permit the tumor to be easily brought out at the end of reduction, if not during the whole course. I have found that it is often extremely difficult to keep the tumor in sight while the reduction is being effected at the splenic and hepatic flexion of the colon.

The following was the technique adopted in this series:

Directly the peritoneum was opened, the end of the tumor was brought out of the wound and the reduction accomplished under the eye. If the tumor lay in the pelvis, it was necessary occasionally to reduce a few inches within the abdomen until the lower end came easily under the wound.

No attempt was made to retain the intestines in the abdomen. If they escaped,—and they did so in the majority of cases,—they were simply covered up with a warm sponge. In fact, the intestines were not the object of any special solicitude. The point aimed at was rapidity of operation. The average time taken in eleven cases in which a note was made was fourteen minutes; in this list are included a resection of gut and the excision of a gangrenous appendix.

Suture.—The incision through the rectus muscle facilitates rapid suture, since the layers are quite distinct in this situation.

The following were the methods adopted: Suture in one layer, 4; suture in three layers, 9; suture through all layers and separate suture of anterior rectus sheath, 6; not stated, 1. Total, 20.

The material used was, as a rule, fine silkworm gut, and in a few cases fine silk.

Of the nine cases sutured in layers, two burst open and required resuture; one of these ended fatally. The case that recovered was resutured by Mr. Llewellyn at the East London Hospital for Children. This want of union in young children is a factor that must be reckoned with, and is best avoided, I think, by using deep sutures through all the coats and separate suture of the anterior rectus sheath.

The cause of the reopening of the wound is the failure of reaction and the sloughing of the delicate tissues in the embrace of the sutures, when only thin layers are included.

I have within the last six months seen the scar in all the successful cases, and in every instance they were perfectly sound. This fact tends to show that, as regards ultimate results, the method of suture is immaterial.

Results of the Operations.—The time that elapsed between the operation and the advent of death showed that the fatal result was not directly due to the effects of the operation.

The intervals were: (1) six days; (2) six days; (3) ten days; (4) few hours.

The causes of death were: (1) bursting open of the wound; (2) thrombosis of cerebral veins (resection case); (3) gangrene of cæcum and inanition; (4) shock; extensive resection of nearly the whole of the large gut.

Mr. Barker, who has had great experience of these cases, lays special stress on reducing the intussusception within the abdomen in order to reduce shock. This series seems to show that after all too much stress can be laid on this point, as no attempt was made to keep the intestines in if they insisted in coming out. It seems to me that much valuable time may thus be lost. The two methods, at any rate, show equally good results.

The Appendix.—One interesting point in the series was the difference in the appearance of the appendix. In five instances this organ was normal in color, though the intestine in its immediate neighborhood was black from congestion. It did not appear that the variety of intussusception had any relation to the state of this organ.

After-history.—With three exceptions, I have traced all the successful cases.

In all the scars are sound, no matter the method employed. In all the children are healthy and well, except in one case, where attacks of vomiting occurred at times. This case succumbed to acute strangulation by a band.

Case.—A. W. B. suffered from attacks of vomiting at times, for which he was admitted to hospital. With simple treatment the attacks subsided, and, as nothing abnormal was noted in the abdomen, no operative measures were proposed. In June, 1904, the child (then four years old) was admitted for acute intestinal obstruction. The obstruction, due to a band passing from the mesentery to the bowel wall, was relieved, but death ensued in forty-eight hours.

It is remarkable that a child aged only sixteen weeks and extremely ill should have survived a cœliotomy for the reduction of an intussusception, while at the age of four it should have succumbed to a like operation for the relief of acute obstruction by a band. It certainly serves to show how very grave a disease is acute obstruction by a band. This fact has been emphasized by Mr. Makins, who believes that but little improvement in the mortality of this disease has taken place of late years.

The Fall in the Mortality.—In my series there were twenty cases and four deaths, which give a mortality of 20 per cent. If the cases in which a resection was performed were excluded, the mortality falls to 11.11 per cent.

Taking the cases under one year of age, there were sixteen, with three deaths; mortality, 18.75 per cent.; or, excluding the case of resection, 13.33 per cent.

From Sargent's tables (*St. Thomas's Hospital Reports*, 1900), I find that from 1892 to 1901 there were sixty-two cases of intussusception in children under one year, which were treated by cœliotomy (inflation has been tried in some). There were thirty-eight deaths, or a mortality of 61.29 per cent. If all the cases under one year are taken into account, the numbers are seventy-two cases, and the mortality 61.11 per cent.

Barker (*Clinical Society's Transactions*, Vol. xxxi) gives the following figures from cases that occurred in University College Hospital from 1892 to 1896 (both years included): Under one year, fifteen cases; mortality, 40 per cent.; under one year, treated by cœliotomy (either primary or after inflation), fourteen cases; mortality, 42.86 per cent. Of cases treated by Barker himself, there were twenty-five, with a mortality of 28 per cent.

Mr. D'Arcy Power in 1898 stated that the mortality of cases (not necessarily under one year) operated on within forty-eight hours of the onset was 22 per cent., and expresses the belief that this would be lower in the near future. The improvement that has taken place is well shown in the following table of cases treated at St. Thomas's Hospital (Sargent). All cases under one year (no matter how treated):

	DIED.	CURED.	
1892	3	1	
1893	2	0	
1894	1	1	
1895	4	1	
1896	5	1	
1897	6	1	
1898	4	2	Cœliotomy (primary) as a routine measure.
1899	6	8	
1900	6	6	
1901	7	7	
	44	28	

Total, 74; mortality, 61.11 per cent.

In the last three of the above years there were forty cases with nineteen deaths, or a mortality of 47.5 per cent.

Intussusception, like appendicitis, seems to be on the increase, at any rate as regards those admitted to hospital.

The following figures are from St. Thomas's:

Year. (Periods of five years.)	Number of Cases of Intussusception.	Total Number of Admissions to St. Thomas's Hospital.
1879–1883	10	20,016
1884–1888	10	23,103
1889–1893	12	25,338
1894–1898	40	29,493
1899–1903	90	31,547

From this it will be seen that the number of intussusceptions has increased tenfold, while the total admissions, all departments included, have only increased by one-half. The increase is therefore actual and relative.

In conclusion, and as showing well the strides that have been made in treatment, I cannot do better than quote one or two passages from a book * written by a great authority on this subject in 1884.

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* Some points in the Anatomy, Pathology, and Surgery of Intussusception.

TABLE OF TWENTY CASES OF

No.	Name.	Sex.	Age.	Duration of Operation.	Situation of Tumor.	Method of Feeding.	Nature of Intussusception.	Method of Suture.
1	A.W.B.	M.	16 weeks.	7 hours.	Left iliac fossa.	Not stated.	Ileocæcal.	1 layer.
2	A. S.	M.	5 months.	10 hours.	Umbilical.	"No improper food."	Enteric—ileocæcal.	Not stated.
3	F. W.	M.	20 weeks.	2 days.	Present; situation not stated.	Not stated.	Ileocæcal.	3 layers.
4	F. C.	F.	33 months.	6 days. ? 3 weeks.	Left iliac fossa, also protruded from anus.	Nothing wrong noted.	Ileocæcal.	1 layer.
5	J. B.	M.	17 months.	3 days.	Left loin, also felt in rectum.	Breast, also bread and butter.	Ileocæcal.	Deep and rectus sheath sutures.
6	L. L.	F.	7 months.	30 hours.	Left iliac fossa.	Breast, occasional bread and butter.	Enteric—ileocæcal.	Deep and ant. rectus sheath sutures.
7	H. R.	M.	8 months.	4 days.	Right hypochondrium.	Breast.	Ileocæcal.	3 layers with 1 deep suture.
8	A. H.	F.	3 months.	36 hours.	Left lumbar, felt in rectum.	Breast.	Ileocæcal.	3 layers with 2 deep sutures
9	C. A.	F.	6 months.	2 days.	Left loin, felt in rectum.	Breast and bottle.	Ileocæcal.	Deep and ant. rectus sheath sutures.
10	J. R.	M.	5 months.	26 hours.	Splenic region.	Breast.	Enteric—ileocæcal.	3 layers and 1 deep suture.
11	S. B.	M.	5 months.	18 hours.	Umbilical region.	Breast; had a piece of mackerel.	Ileocolic—ileocæcal.	3 layers.
12	E. A.	F.	5 months.	18 hours.	Umbilical region.	Breast.	Ileocolic—ileocæcal.	3 layers.
13	P. S.	F.	21 months.	2 days.	Splenic region.	Not stated.	Colic.	3 layers.
14	W. F.	M.	4 months.	12 hours.	Splenic region.	Breast.	Ileocolic—ileocæcal.	3 layers.
15	S. P.	F.	3 months.	28 hours.	Splenic region.	Breast.	Enteric—ileocæcal.	Deep and ant. rectus sheath sutures.
16	R. W.	M.	8 months.	8 hours.	Left loin.	Breast.	Ileocæcal.	Deep and ant. rectus sheath sutures.
17	M.R.F.	F.	2 years.	2 days.	Left loin.	Nothing abnormal.	Ileocæcal.	3 layers.
18	A.W.P.	M.	5 months.	14 days or 30 hours.	Left loin.	Breast, some bread.	Ileocolic—ileocæcal.	Deep sutures.
19	R. S.	M.	6 months.	25 hours.	Umbilical region.	Not stated.	Ileocolic—ileocæcal.	Ant. sheath and deep sutures.
20	L.C.W.	M.	9 months.	1 week.	Left loin.	Breast till eight months, then little bread and butter.	Ileocæcal.	Deep.

CASES, 20. Males, 12; Females, 8.

Ileocæcal	10 or 50	per cent.
Enteric-ileocæcal	4 or 20	" "
Ileocolic-ileocæcal	5 or 25	" "
Colic	1 or 5	" "
	20 or 100	per cent.

Duration of Operation.	Reduction.	Result.	Remarks.	Year.	Ultimate History.
Under 25 minutes.	Easy.	C.	Child apparently moribund before first operation.	1898, May.	January, 1904. Scar sound. Has attacks of vomiting, cause not to be made out. Died of acute strangulation by a band, June, 1904.
10 minutes.	Final part of ileo-cæcal difficult.	C.	Reduction by inflation had failed. Small enteric tumor remained after main reduction.	1899, May.	Well at end of six months. January, 1904, not traced.
7 minutes.	Difficult at cæcum.	D.	Wound found burst open on fourth day. Resutured.	1899, Jan.	Post-mortem. Cæcum still infiltrated with blood. Died on sixth day.
10 minutes.	Impossible	D.	Reduced to hepatic flexure, when outer coat was found to have sloughed in a linear manner for the extent of three-quarters of circumference of gut. Excision. Artificial anus. Food taken well. Bowels acted.	1899, April.	Died on tenth day. Post-mortem. Thrombosis of cerebral veins. No peritonitis.
10 minutes.	Easy.	C.	Pulse 160 on admission, abdominal facies. Tumor palpable only under anæsthetic.	1901, July.	Well in October, 1903.
10 minutes.	Difficulty at cæcum.	C.	Inflated three times, but recurred. Enteric tumor measured two and a half inches. Appendix normal in color, though cæcum was black.	1901, July.	Not traced.
13 minutes.	Difficult near cæcum.	C.	Appendix quite normal in color. Inflation had failed.	1901, Nov.	Well in October, 1903.
13 minutes.	Difficult.	C.	Tumor only felt under anæsthetic. Appendix normal in color, though cæcum was black.	1901, Dec.	Quite well. Scar sound, February, 1904.
Not stated.	Easy.	C.	Tumor could be felt in rectum.	1901, April.	January, 1904. Quite well. Scar sound.
9 minutes.	Difficult at cæcum.	C.	Appendix only slightly congested.	1902, Nov.	January, 1904. Quite well. Scar sound.
27 minutes.	Very difficult indeed.	D.	Appendix normal at base, but sloughing at apex, excised. Four inches of ileum through valve. Last two inches of ileum had a thick patch of infiltration on wall opposite mesentery, suggestive of a tumor; incision showed only blood in tissues.	1903, April.	Child died of marasmus. Post-mortem. Cæcum and several inches of ileum color black and almost gangrenous. Death on sixth day.
20 minutes.	Ileocolic difficult.	C.	Ileum through valve for space of three inches.	1903, May.	January, 1904. Quite well. Scar sound.
Not stated.	Easy.	C.	Dimple in the transverse colon at starting-point of tumor.	1903, Aug.	January, 1904. Quite well. Scar sound.
Not stated.	Easy.	C.	Wound found burst open, resutured. Six to eight inches of small gut through the valve, last two inches deeply congested.	1903, Sept.	Well some months after operation, 1904.
Not stated.	Easy.	C.	Small enteric separated by a distinct interval from the valve.	1903, May.	Well some months after operation, 1904.
Not stated.	Difficult at cæcum.	C.	Cæcum dimpled; apparently this was the starting-point.	1903, Nov.	January, 1904. Quite well. Scar sound.
Not stated.	Difficult.	C.	Large dimple on cæcum that would not be everted. Appendix normal in color.	1903, Feb.	Not traced.
20 minutes.	Extremely difficult.	C.		1904, Feb.	Cæcum burst open in attempt to reduce ileocolic portion. Inner middle layers extruded and reduced like a paraphimosis. Cæcum sutured.
15 minutes.	Easy.	C.	Appendix normal in color.	1904, March.	
20 minutes.	Impossible	D.	Gut ruptured just below splenic flexure. Not gangrenous, but extremely friable. Resection. Artificial anus.	1904, April.	Death in a few hours.

Died, 4. Mortality, 20 per cent.; or, excluding two cases of resection, 11.11 per cent.
Under one year of age: Mortality, 18.75 per cent.; or, excluding the case of resection, 13.33 per cent.

"The administration of opium is absolutely essential in these cases; there are substantial reasons for believing that under the influence of opium, administered early, an invagination may undergo cure by spontaneous reduction. Perceiving, as is probable, that no marked improvement follows, the next measure is in an attempt to reduce the invagination by means of enemata or insufflation. These modes of treatment have met with very encouraging success, and are worthy of a patient trial. Should these measures fail, there are substantial reasons for recommending an immediate laparotomy, especially in the young."

In twenty years, then, cœliotomy has risen from a last resource to a primary measure.